U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-273 983

Are We Controlling Water Pollution in the Southeast

Federal Water Pollution Control Administration, Atlanta, Ga.

Oct 68

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2.	PB 273 983

4. Title and Subtitle
Are We Controlling Water Pollution in the Southeast?

5. Report Date
October 1968

6.

7. Author(s)
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8. Performing Organization Rept. No.

9. Performing Organization Name and Address
U.S. Dept. of Interior
Federal Water Pollution Control Administration
1421 Peachtree St.
Atlanta, GA 30309

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address
NOW: U.S. EPA, Region IV
345 Courtland St.
Atlanta, GA 30308

13. Type of Report & Period Covered
Informational
1960-66

14. 904/00

15. Supplementary Notes Presented at the Environmental Control Conference, American Institute of Chemical Engineers, Mobile, AL Oct. 11, 1968

16. Abstracts

A discussion of the progress of Water Pollution Control in the Southeast during the early and middle 60's. Costs during that period are reviewed as are some of the problems associated with pollution control in general.

17. Key Words and Document Analysis. 17a. Descriptors

Water Pollution Abatement Southeast Region (U.S.A.)
Southeastern Region (U.S.A.) Water Pollution Abatement

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

REPRODUCED BY
NATIONAL TECHNICAL INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

18. Availability Statement
Unlimited available

19. Security Class (This Report)
UNCLASSIFIED

20. Security Class (This Page)
UNCLASSIFIED

21. No. of Pages
22

22. Price
A02 - A01

ARE WE CONTROLLING WATER POLLUTION IN THE SOUTHEAST?

by

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*Presented at the Environmental Control Conference, American Institute of Chemical Engineers, Mobile, Alabama, on October 11, 1968.

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The Southeast is one of the last frontiers of natural bounty in this country. It is still mostly green with fertile fields and dense forest, well stocked with wildlife. And there is an abundance of water.

Because of the availability of these resources, especially water, the Southeast is also one of the fastest developing regions of the United States. As a result, great changes are taking place. Population is growing. The per capita use of water is increasing. Demands for outdoor recreation are rising sharply. But the most conspicious change is the expansion and diversification of industry.

All this is putting a strain on the whole enviornment. Yet, the biggest burden is being put on water, which has always been a primary source of life, wealth, and enjoyment.

Water is the number one raw material of industry. It is a power source, a coolant, a transporting device, an ingredient, and a cleansing agent.

As the population grows so does the drain on municipal supplies. Higher standards of living and sanitation -- multiple bathrooms, home laundries, garbage grinders -- mean greater consumption of water per capita.

With increasing leisure on hand, more and more people turn to water for recreation. They have a natural desire to swim, fish, go boating, picnic and camp beside water, or just to look at it. This water use cannot be measured in gallons, but it is fast becoming a multi-billion dollar industry in the Southeast.

The demographers and the economists tell us that the population will continue to grow rapidly and the economy will continue to expand. Inevitably, the demand for all water uses will follow this trend.

Let's take a closer look at what is happening to our enviornment and some of the forces behind it.

The Southeast is rapidly shifting from a predominantly rural-agricultural region to one that is predominantly urban-industrial.

In 1930, the population for the seven-state area of Florida, Georgia, Alabama, Mississippi, Tennessee, North Carolina and South Carolina was 16 and one-half million. It was about evenly distributed between urban and rural.

In 1960 -- thirty years later -- the total population not only had increased sharply but the gap between urban and rural had widened tremendously. The urban population had nearly tripled -- to 21 and one-half million, whereas the rural population had decreased to less than three and one-half million.

By 1990, the distribution of population is expected to show even more startling contrasts. Of the projected 42 and one-half million total population in the seven-state area, nearly 41 and one-half million will be living in urban or rural-non-farm areas -- five times the 1930 figure. This leaves less than one and one-half million people living in rural-farm areas.

Industrial expansion, of course, is accompanying the population growth. Combined, they stimulated a 300 percent increase in electric energy production from 1945 to 1959. Manufacturing accounted for more than one million jobs in the region in 1960 and can be expected to more than double in the next fifty years.

Most of the industrial development is, and has been, in and around metropolitan centers. However, the pulp and paper industry, which is rapidly expanding, is developing along the lower reaches of the larger streams, some of them distant from metropolitan areas. A portion of the chemical industry

also is developing along the lower reaches of rivers and creeks.

While this surge of activity is producing material prosperity, it is, at the same time, spawning one of the scouges of modern civilization -- water pollution. Increasingly, we are offended by raw sewage, unsightly dyes, odorous chemicals, and oily deposits. Long reaches of some of our rivers and creeks are little more than open sewers and some of our lakes and estuaries are nothing more than cesspools.

What is the source of this pollution? Much of it comes from the tons and tons of wastes discharged every day by the cities and industries. Some of these wastes are inadequately treated or not treated at all. It would be unfair to say that industries are the bigger offenders than municipalities, or vice versa, for one causes about as much water pollution as the other. However, some of the more complex industrial wastes are more difficult to deal with than municipal wastes. Thermal pollution, caused by heated water discharged from cooling systems, also is a serious form of industrial pollution.

The municipal sewerage system and the industrial plant are by no means the only sources of pollution. It comes from septic tanks, dredge and fill operations, agricultural fertilizers, and raw sewage from yachts and houseboats. Wastes from one boat may seem of little consequence, but wastes from many boats contribute significantly to the total water pollution.

Builders, developers, contractors -- everyone involved in disturbing the natural surface of the earth -- add their bit. Highway construction, housing developments, shopping centers -- these and a host of other projects that are constantly changing the face of the earth, result in seriour water pollution problems when the rains come. One of the major problems is the silt and debris that washes into lakes, rivers and creeks when natural

cover is stripped from the ground.

Animal wastes from farm feedlots, improper or excessive use of pesticides and fertilizers, careless discard of trash and junk also are among the many causes of pollution.

Whate is the effect of all this? Heavy concentration of bacteria is a hazard to health and renders water unfit for water contact recreation. Instant fish kills may result from deadly chemicals or poisons. Aquatic life also may be killed directly by hot water discharged into a river or lake, or the survival of certain species may be treated by interference with their reproduction.

In some cases, waste products do not directly kill or harm organisms but instead stimulate the growth of noxious plant and microorganisms and otherwise seriously disturb the balance of nature. This type of nutritional stimulation is known as eutrophication and is a field of modern biological research.

In addition to the quality of the water, the condition of the bottom, the substratum, of aquatic environments may become so altered as to constitute a type of contamination. As interstate highways tranverse rivers, soil is loosened and carried downstream. As harbors and marinas are dredged, the bottom is disturbed and shifted. The resultant sedimentation may smother bottom-dwelling animals or make the substratum so unstable that life there becomes very precarious and finally impossible.

Of increasing concern is the spoilage of our estuarine areas, which includes sounds, river mouths, marshes and all those areas where sea and fresh water mix. They are etched along the hundreds of miles of coastline bordering Georgia, Florida, Alabama and Mississippi. Ahd there is growing evidence that once they have been throughly poisoned, they can never be fully repaired.

The estuaries are among our richest resources -- richer than the land on one hand and the open sea on the other. The ebb and flow of water is one of the mechanisms that contributes to this fertility. Such back-and-forth circulation constantly concentrates and distributes the vital gases, such as oxygen and carbon dioxide, and minerals, such as nitrates and phosphorous, on which productivity depends.

An estuary acts essentially as a "nutrient trap" in that nutrients are held and concentrated in the estuarine zone. Pesticide pollution, a growing problem everwhere, can be especially critical to an estuary, since the nutrient trap mechanism not only traps and concentrates useful minerals, but also poisons, especially the persistent materials such as DDT.

Marshes are important nursery grounds for almost all species of commercial shrimp and fish. The young stages of these species congregate and undergo their most rapid growth in the marshes and upper tidal creeks where productivity of plants and microorganisms is greatest.

For example, commercial shrimp spawn offshore and the young larval stages move into the small creeks and marshes where most of their growth takes place. On reaching adult size, they then move out through the sounds and offshore water where they are harvested. If the salt marshes and the network of tidal creeks are filled in, dredged or destroyed, or if they are made inaccessible to incoming larval stages by downstream pollution, then a substantial portion of larval food needed would be cut off, drastically reducing the seafood potential of the entire estuarine zone.

The increasing discharge of untreated sewage is particularly harmful to shellfish industries. The estuary of the Altamaha River in Georgia once had the highest concentration of oysters anywhere along the Atlantic

Coast. Now, it has been closed to the oyster industry because of the high concentration of coliform bacteria.

Apalachicola Bay on Florida's upper Gulf coast, known as the oyster capital of Florida, produces about 70 percent of the total harvest. But a sizable portion of the beds at the mouth of the Apalachicoal River is closed due to excessive coliform bacteria.

The vast oyster beds of the Pascagoula estuary in Mississippi also are closed at times because of bacterial pollution.

And Mobile Bay, much of which is fresh water during high spring runoffs, is closed to shellfish harvesting during this period because of the high level of total coliform concentrations.

This is only the beginning of the list of water pollution problem areas in the Southeast. There is hardly a stream that has not felt the impact of some type of pollution, and in varying degrees. As might be expected, the most serious problems are in and around the centers of population and industry.

In order to evaluate net progress or net degradation it is necessary to establish a base of comparison. This has been done in the past on the basis of "River Miles Improved"; but in the absence of detailed field studies this must necessarily be quite an arbitrary determination. It has also been done on the basis of dollars invested. But this, too, varies with inflation and with the physical conditions prevailing at a given site.

That past measures have been of considerable magnitude is attested to by the records of the Southeast Region Water Pollution Control Administration. Through August 31, 1968, 868 water pollution control

projects had been approved for construction grants amounting to $125 million in the states of Tennessee, Mississippi, Alabama, Georgia, Florida, Puerto Rico and the Virgin Islands. The total cost of these projects will exceed $520 million dollars.

But are we really controlling water pollution? In order to answer this question more objectively the National Conference of State Sanitary Engineers began a project in 1960. This included an annual appraisal of the backlog of needed municipal waste treatment facilities as reported by the respective pollution control administrators for the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands and Guam. These reports are based on estimates of the population remaining to be served: (1) By sewerage systems with no treatment plants; (2) By sewerage systems discharging inadequately treated sewage and (3) In unsewered communities which, in the judgment of the Administrator, are potential sources of water pollution and which, in addition, frequently experience public health problems through the drainage of septic tank effluents to ground and surface waters.

Obviously such estimates require difficult decisions by the Administrator. He must determine what constitutes "inadequately treated sewage" and in what unsewered communities pollution problems exist. For this reason, it would be difficult to compare one state with another, but trends in individual states can be shown by a comparison of their annual estimates. This has been shown by comparing, with bar-graphs, urban and rural non-farm population for each of the contiguous Southeastern States for each year from 1960 to 1966. See Figure I through Figure V.

The shaded portion of each bar represents the estimated number of persons for which pollution abatement measures are needed. Although these numbers tend to remain almost constant in total, the portion of the urban population served by adequate facilities (assumed to be represented by the unshaded portion of the bar) increases generally proportional to growth.

Based on this brief analysis, then, it appears that the Southeast is barely holding its own with municipal sewage treatment to serve a rapidly expanding urban population.

One factor should be noted, however. The foregoing data predated the effective date for states' adoption of standards of water quality for interstate waters, as designated by Congress in the Water Quality Act of 1965. This powerful stimulant, together with the bolstering of state laws by several state legislatures, and the impetus of previously authorized planning, only now becoming effective, undoubtedly will speed up pollution abatement programs.

Unfortunately, there is no similar relatively simple measure of industrial pollution abatement progress. Even if a practical common denominator, such as "population equivalent", could be applied universally, the variation among industries and segments of industries is too great to permit such comparisons.

Based on observed stream conditions it appears probable that generalities applied to municipal wastes can also be applied to industrial wastes. Therefore these conclusions may be drawn:

1. Industrial development in the Southeast is increasing rapidly. And while both new industries and old have expended large sums for pollution abatement, the residual pollution from untreated or inadequately

treated wastes, together with the gradually accumulating remaining portion of, as originally considered, adequately treated wastes, leaves the level of water pollution still too high in many streams.

2. More complete river regulation by structural measures tends to decrease the assimilating capacity of streams and thus increase the need for pollution abatement.

3. The adoption of water quality standards and the increasing fish and wildlife and recreational uses have greatly increased the need for pollution abatement and will require more complete treatment of all wastes. Advanced waste treatment is already a recognized alternative to low flow augmentation and will increase in importance.

4. As the ratio of treated waste flow to stream flow becomes greater, remaining increments, that until now, had been minor pollution constituents, will increase in importance, requireing more exotic or sophisticated treatment processes.

All of these observation point up the increasing complexity and mounting cost of all pollution abatement measures and the need for considering all possible alternatives. One alternative that has received too little attention is the possibility of combining wastes from industries and (or) municipalities to permit the use of larger treatment facilities.

The most obvious advantage of larger-sized treatment facilities, when compared with two or more smaller units treating increments of the same waste load, is the reduction in both construction costs and operating costs. Figures VI and VII were developed to illustrate this advantage.

Figure VI shows the first cost in 1968 dollars of providing activated sludge treatment for a city of 60,000 persons; for a 500 ton Kraft pulp and paper mill; and for the combined wastes from the 60,000 population city and

from the 500 ton plant. Individually, the two treatment works total $4,100,000. Combined, the single, larger treatment plant is estimated to cost $3,500,000.

Figure VII shows estimates of the annual operating and maintenance costs of the same two facilities operating separately and of the single combined facility. In the first instance the annual cost is estimated to be $217,000 while for the combined case the estimated annual cost was only $170,000.

The above quoted figures are based on the assumption that the two sources of waste are equally treatable. When one of the sources is industrial waste this is not always the case, since the industrial waste may be toxic to the biota necessary to break down the organics in sewage. In such a case the industrial waste must be pretreated or possibly the combination simply is not compatible.

On the other hand, it is possible for the sewage to increase the treatability of the industrial waste. This is the case where the industrial waste has a nutrient deficiency which the sewage can supply in whole or in part. Sewage also is a good buffering agent and can tolerate relatively large concentrations of acid or alkali. Different industrial wastes may also be more treatable in combination than separately. The proof is literally in the eating - by organisms that is - and usually only a pilot sutudy will disclose whether the combination is treatable.

In order to utilize the larger waste water treatment facilities, usually required when industrial and municipal wastes are combined, it may be necessary to coordinate the discharge of treated wastes with stream flow.

In cases where stream flow is regulated artificially, both the control of the stream and the control of waste treatment should be fully coordinated. This requires planning --- planning for immediate needs and long range planning to prevent future problems. Planning must include consideration of present and future uses both upstream and downstream. In fact, such planning and its implementation becomes river basin management in its fullest sense.

If a combination of wastes, either industrial, municipal or both, proves to be desirable, a public project probably could be devised for which the federal government would bear a sizeable share of the cost. Such projects, provided they are owned and operated by a public agency, are eligible to the same construction grants as are purely municipal projects. The Federal Water Pollution Control Law requires the state water pollution control agencies to establish a priority list of projects to which grants may be offered if they comply with the basic requirements of the law. Applications must be initiated through the state water pollution control agency, which is required to establish a formula considering financial need, readiness to build, and the severity of the pollution problems, in determining the order in which grants will be awarded.

Various provisions govern the amount of the grant, but the basic grant can be for 30% of the cost of treatment works and interceptors. This can be increased 10% to 33% if the project is part of a comprehensive plan for pollution abatement. And there may be further increases if the state also participates in construction grants and if the state establishes intrastate water quality standards.

The use of public facilities for the treatment of industrial wastes can be advantageous to both the industrialist and to the general public.

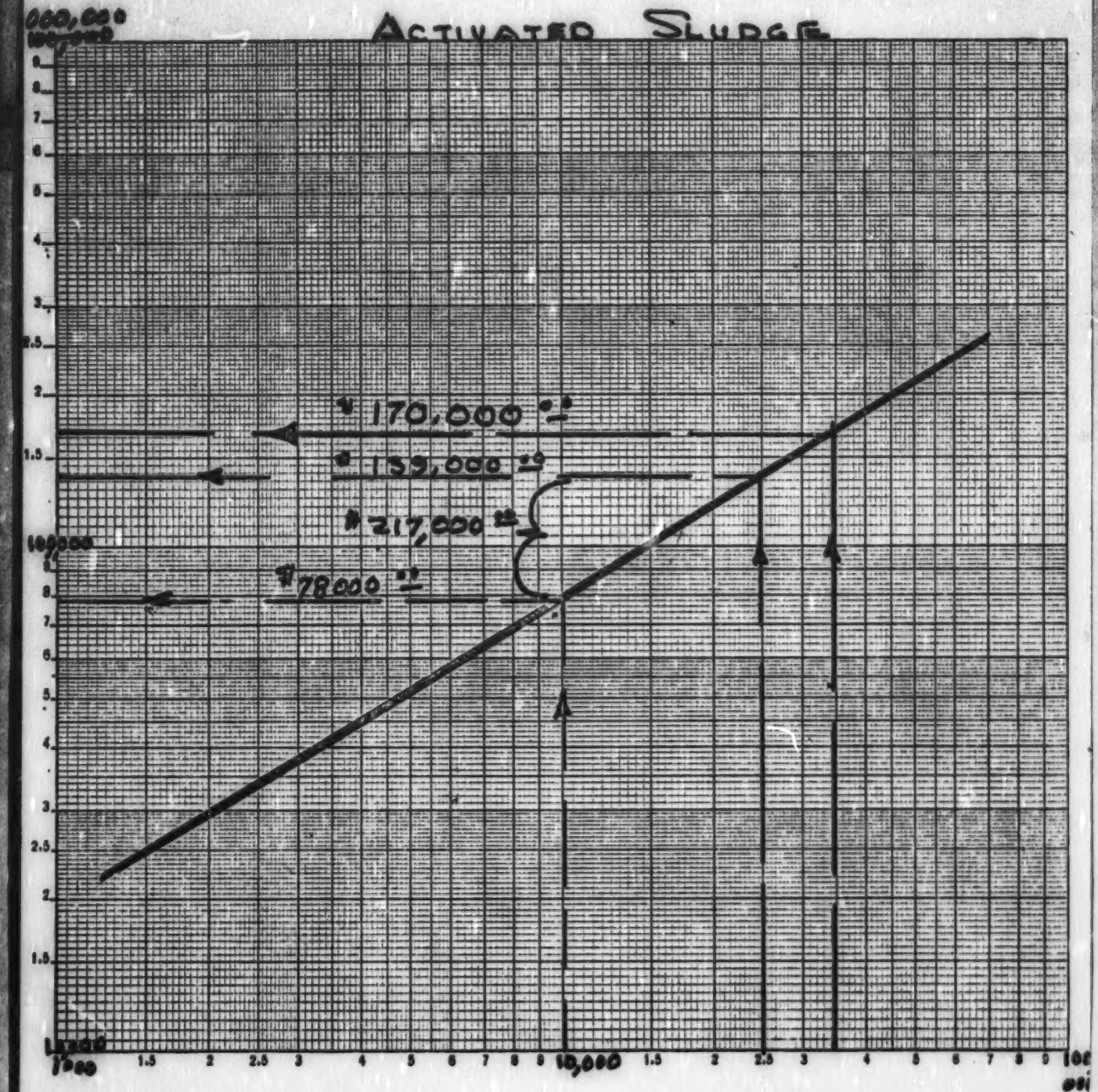
In addition to financial assistance, the public project usually has the advantage of condemnation rights to acquire a plant site. The public agency is not as vulnerable to damage suits as is the private corporation and the public agency probably is not subject to taxes.

The public profits by shifting responsibility for treatment plant operation from a private corporation, over which the public has only regulatory control, to a public agency which operates for the benefit of the public. If the project is properly financed to be on a sound fiscal basis, and if the operation of the facility is in the hands of competent professional management, the resulting pollution abatement effort is usually more productive and more uniform than can be sustained by most private corporations.

There are, of course, many situations where combined treatment is not possible, but generally it should be considered as a serious alternative until proved infeasible. It is abundantly clear that the trend is toward more highly efficient treatment processes to assure protection of water uses, even though industries, municipalities, and even agriculture, continue to grow and produce more waste containing more complicated substances. Processing these wastes is fast becoming a specialty. Therefore, the more frequently management can be entrusted to professional waste treatment specialists the better operating results can be expected to be maintained.

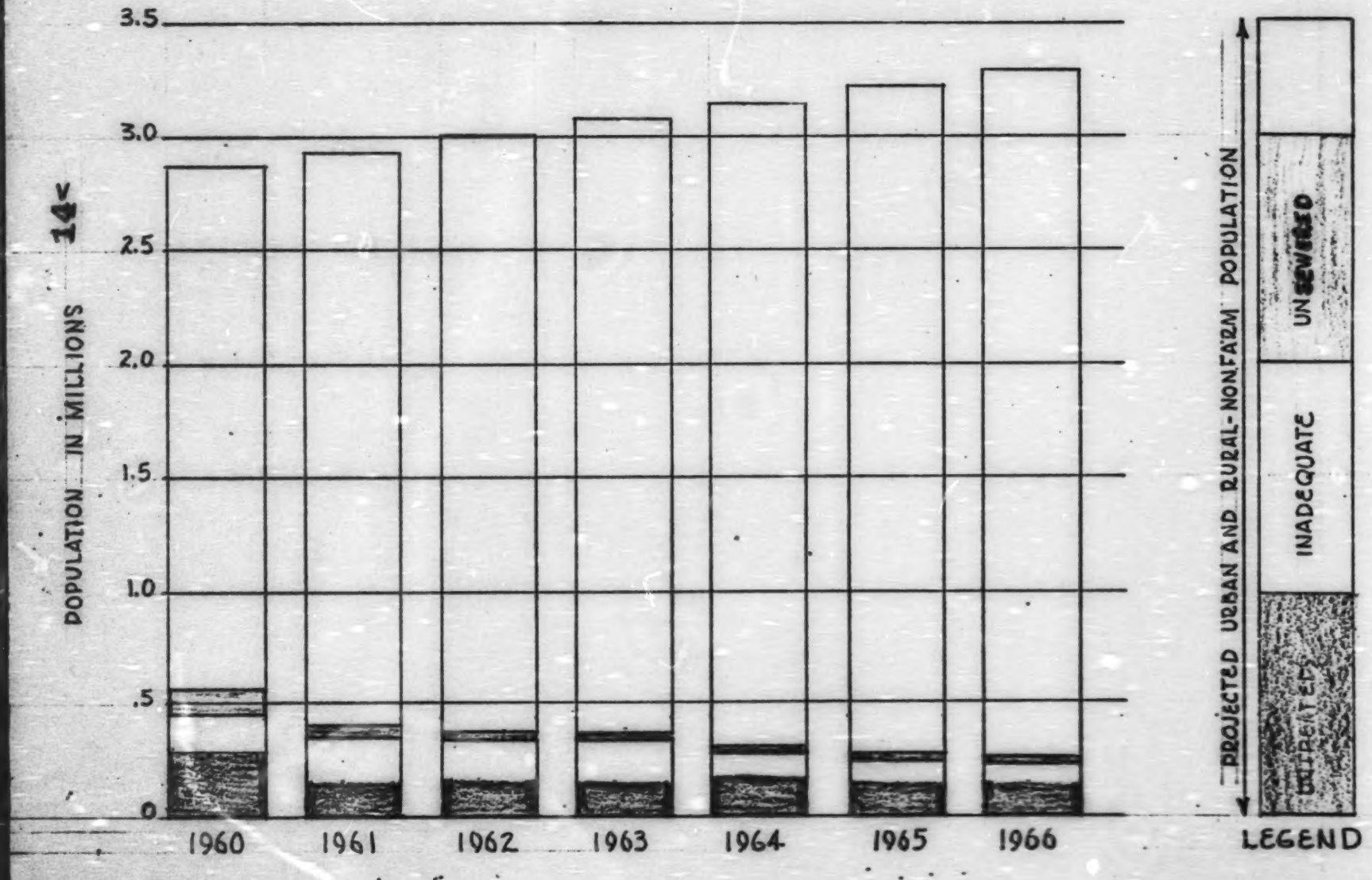
Our salvation from pollution lies in cooperative and coordinated planning, building and operating for the benefit of all.

OH & M COST COMPARISON



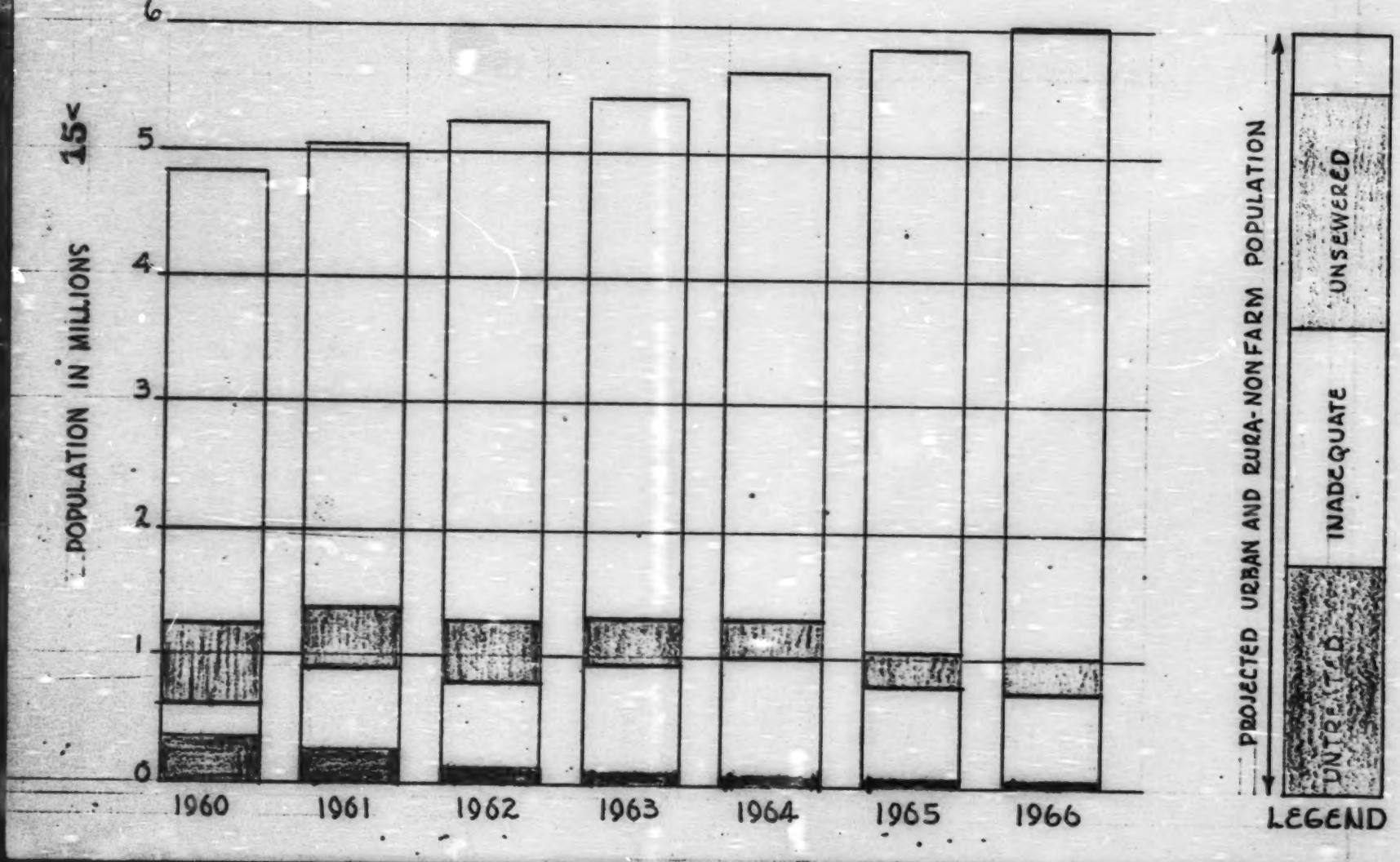
I

PROGRESS OF POLLUTION ABATEMENT 1960-1966
ALABAMA



II

PROGRESS OF POLLUTION ABATEMENT 1960-1966
FLORIDA



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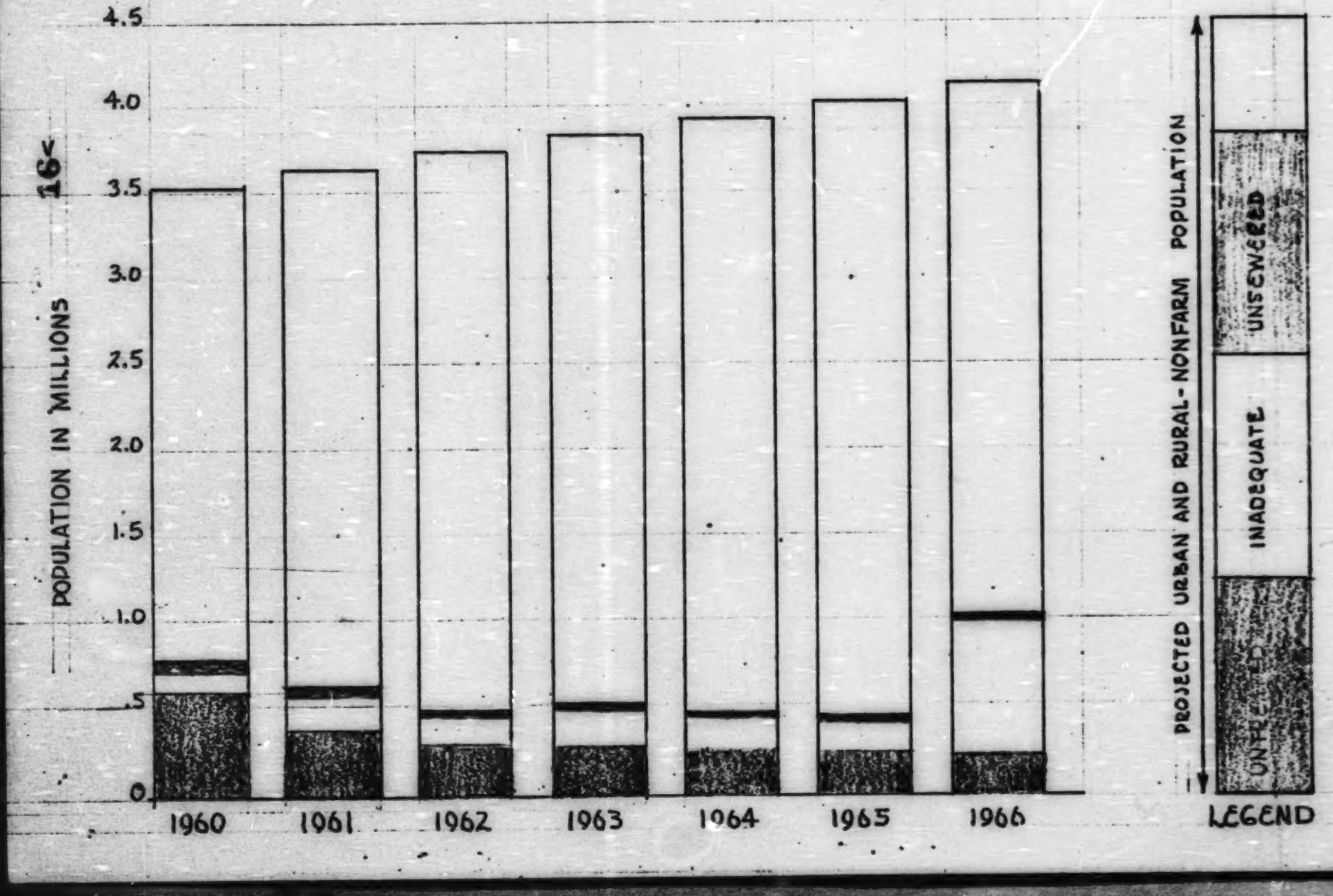
PROGRESS OF POLLUTION ABATEMENT 1960-1966
GEORGIA



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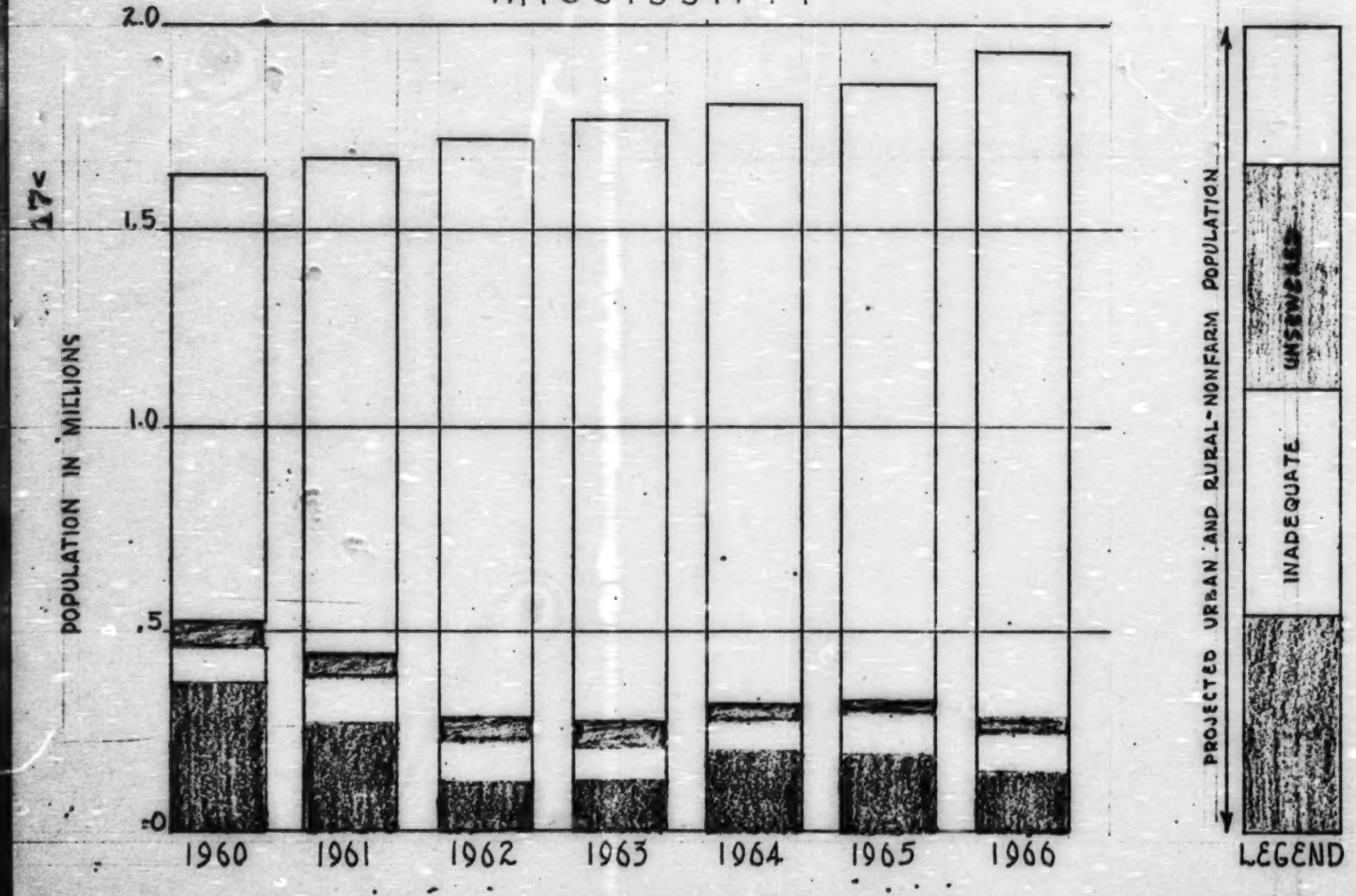
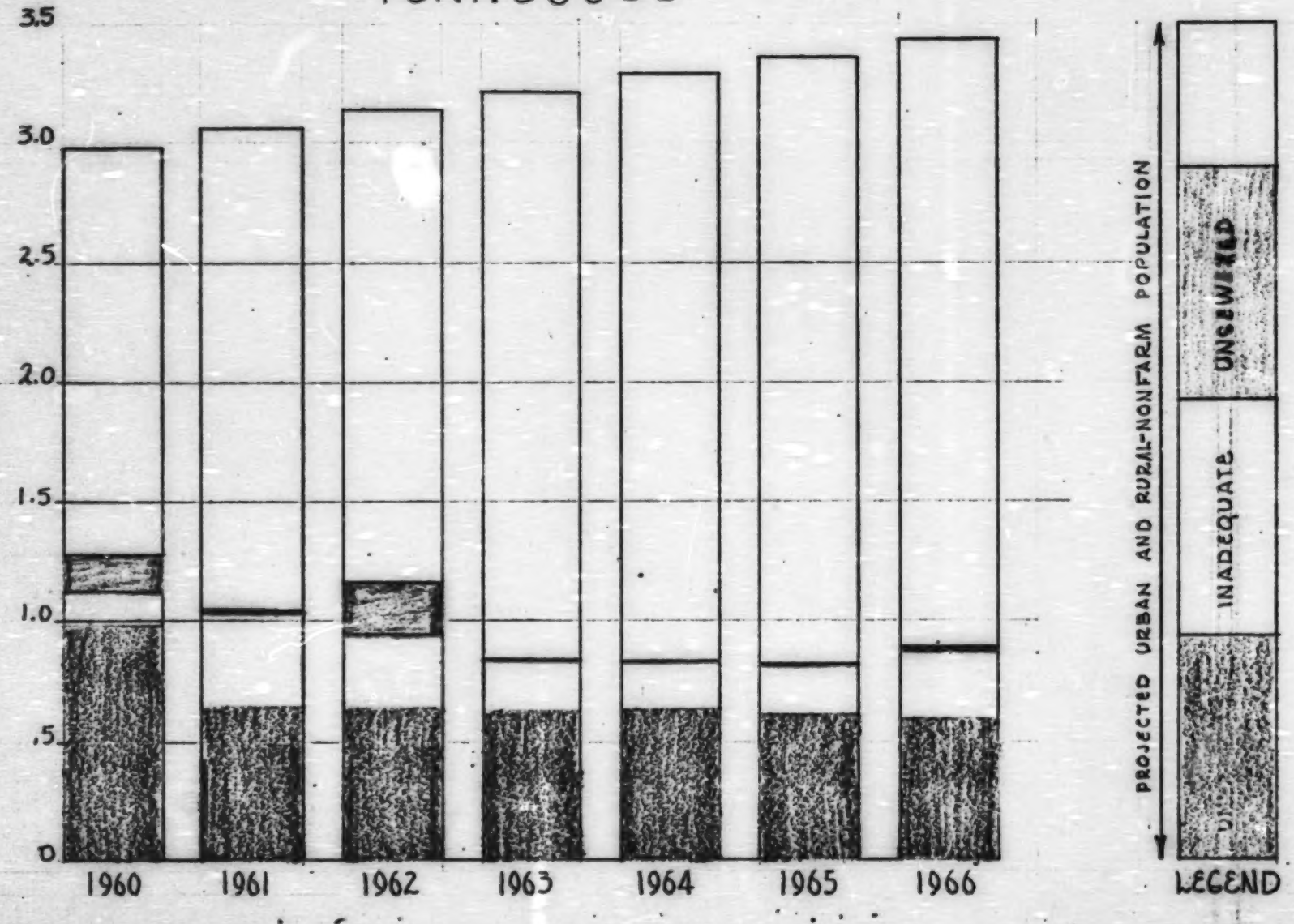
PROGRESS OF POLLUTION ABATEMENT 1960-1966
MISSISSIPPI



V

PROGRESS OF POLLUTION ABATEMENT 1960-1966
TENNESSEE



VI

First Cost Comparision